

Application No. 09/935,392
Amendment dated September 16, 2003
Reply to Office Action of June 16, 2003

The following listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

Claims 1 and 2 (canceled)

Claim 3 (previously amended): The medication delivery system of claim 25, wherein said elastic member is a spring.

8, Claim 4 (previously amended): The medication delivery system of claim 25 wherein said bolus injector is positioned in series with said infusion pump, said injector inlet is connected to said pump outlet, and said bolus injector further includes an outlet valve positioned at said injector outlet and transitionable between an open position and a closed position, wherein said outlet valve is biased to said closed position and transitioned to said open position in response to ambient pressure of a fluid medication contacting said outlet valve.

Claim 5 (previously amended): The system of claim 25, wherein said bladder has an elastic memory to restore said bladder to an initial configuration after said bladder is deformed by compression.

Claim 6 canceled

Claim 7 (previously amended): The system of claim 25, wherein said pump flowpath includes a sight window oriented to enable visual contact with said drip chamber.

Claim 8 (previously amended): The system of claim 25, wherein said outlet tube is configured to revert said drip stream exiting said flow restriction to a reverted continuous

stream.

Claim 9 (previously amended): The system of claim 25, wherein said bolus chamber has a fluid capacity substantially less than said fluid storage chamber.

Claim 10 (previously amended): The system of claim 25 further comprising an outlet valve positioned at said injector outlet and transitionable between an open position and a closed position, wherein said outlet valve is biased to said closed position and transitioned to said open position in response to ambient pressure of fluid medication contacting said outlet valve.

§, Claim 11 (withdrawn after being previously amended): The medication delivery system of claim 25 wherein said infusion pump including said fluid storage chamber, said pump outlet, said displacement piston, and said elastic member is a second infusion pump including, a second fluid storage chamber, a second pump outlet, a second displacement piston, and a second elastic member, said system further comprising a first infusion pump including, a first fluid storage chamber, a first pump outlet, a first displacement piston displaceably positionable to expand or contract said first fluid storage chamber, and a first elastic member transitionable between a more stressed position and a less stressed position to displace said first displacement piston, wherein said bolus injector is positioned in series with said second infusion pump, and said injector inlet is connected to said second pump outlet, and said system further comprising a junction connecting said first pump outlet with said injector outlet and a common flow tube exiting said junction and in fluid communication with said first pump outlet and said injector outlet.

Claim 12 (withdrawn after being previously amended): The system of claim 11, wherein said first infusion pump further includes a first pump flowpath providing fluid communication between said first fluid storage chamber and said first pump outlet, said

first pump flowpath having a flow restriction and a drip chamber, and wherein said flow restriction is sized to convert a continuous stream of fluid entering said flow restriction from said fluid storage chamber to a drip stream exiting said flow restriction into said drip chamber.

Claim 13 (withdrawn after being previously amended): The system of claim 12, wherein said first pump flowpath includes a sight window oriented to enable visual contact with said drip chamber.

§ Claim 14 (withdrawn after being previously amended): The system of claim 12 further comprising an outlet tube positioned beneath said flow restriction in said drip chamber separated from said flow restriction by a drip gap, wherein said outlet tube is configured to revert said drip stream exiting said flow restriction to a reverted continuous stream.

Claim 15 (withdrawn): The system of claim 11, wherein said first elastic member is a spring.

Claim 16 (withdrawn): The system of claim 11, wherein said second elastic member is a spring.

Claim 17 (previously amended): The medication delivery system of claim 25 wherein said pump outlet is a first pump outlet, said infusion pump further includes a second pump outlet for discharging fluid from said infusion pump in response to displacement of said displacement piston, wherein said injector inlet is connected to said second pump outlet, and said system further comprises a junction connecting said first pump outlet with said injector outlet and a common flow tube exiting said junction and in fluid communication with said first pump outlet and said injector outlet.

Claims 18-24 canceled.

Claim 25 (previously amended): A medication delivery system comprising:

- 8,
- a) an infusion pump including,
 - a fluid storage chamber for storing fluid medication,
 - a displacement piston displacably positionable to expand or contract said fluid storage chamber,
 - an elastic member transitionable between a more stressed position and a less stressed position to displace said displacement piston, [and]
 - a pump outlet for discharging a fluid from said infusion pump in response to displacement of said displacement piston,
 - a pump flowpath providing fluid communication between said fluid storage chamber and said pump outlet, wherein said pump flowpath has a flow restriction and a drip chamber with a drip chamber wall, an upper portion, and a lower portion, and wherein said flow restriction is sized to convert a continuous stream of a fluid entering said flow restriction from said fluid storage chamber to a drip stream exiting said flow restriction into said drip chamber, and
 - an outlet tube positioned beneath said flow restriction in said lower portion of said drip chamber and extending toward said upper portion, said outlet tube having a smaller cross section than said drip chamber to define a fluid accumulation space between said outlet tube and said drip chamber wall where at least some of said fluid exiting said flow restriction into said drip chamber accumulates; and
 - b) a bolus injector positioned downstream of said fluid storage chamber in fluid communication with said fluid storage chamber, said bolus injector including,
 - a flexible bladder,
 - a bolus chamber enclosed by said flexible bladder,

an injector inlet into said bolus chamber, and
an injector outlet from said bolus chamber.

Claim 26 (previously amended): A medication delivery system comprising:

- a) an infusion pump including,
a fluid storage chamber for storing fluid medication,
a displacement piston displaceably positionable to expand or contract
said fluid storage chamber,
an elastic member transitionable between a more stressed position
and a less stressed position to displace said displacement piston, [and]
a pump outlet for discharging fluid from said infusion pump in
response to displacement of said displacement piston,
a pump flowpath providing fluid communication between said fluid
storage chamber and said pump outlet, wherein said pump flowpath has a
flow restriction and a drip chamber with a drip chamber wall, an upper
portion, and a lower portion, and wherein said flow restriction is sized to
convert a continuous stream of a fluid entering said flow restriction from said
fluid storage chamber to a drip stream exiting said flow restriction into said
drip chamber, and
an outlet tube positioned beneath said flow restriction in said lower
portion of said drip chamber and extending toward said upper portion, said
outlet tube having a smaller cross section than said drip chamber to define
a fluid accumulation space between said outlet tube and said drip chamber
wall where at least some of said fluid exiting said flow restriction into said drip
chamber accumulates; and
b) a bolus injector positioned in series with said infusion pump including,
a flexible bladder,
a bolus chamber enclosed by said flexible bladder,

an injector inlet into said bolus chamber and connected to said pump outlet, and
an injector outlet from said bolus chamber.

Claim 27 (previously amended): A medication delivery system comprising:

- a) an infusion pump including,
a fluid storage chamber,
a displacement piston displaceably positionable to expand or contract said fluid storage chamber,
an elastic member transitionable between a more stressed position and a less stressed position to displace said displacement piston,
a first pump outlet for discharging fluid from said infusion pump in response to displacement of said displacement piston, [and]
a second pump outlet for discharging fluid from said infusion pump in response to displacement of said displacement piston,
a pump flowpath providing fluid communication between said fluid storage chamber and said first pump outlet, wherein said pump flowpath has a flow restriction and a drip chamber with a drip chamber wall, an upper portion, and a lower portion, and wherein said flow restriction is sized to convert a continuous stream of a fluid entering said flow restriction from said fluid storage chamber to a drip stream exiting said flow restriction into said drip chamber, and
an outlet tube positioned beneath said flow restriction in said lower portion of said drip chamber and extending toward said upper portion, said outlet tube having a smaller cross section than said drip chamber to define a fluid accumulation space between said outlet tube and said drip chamber wall where at least some of said fluid exiting said flow restriction into said drip chamber accumulates; and

b) a bolus injector in fluid communication with said fluid storage chamber including,

- a flexible bladder,
- a bolus chamber enclosed by said flexible bladder,
- an injector inlet into said bolus chamber and connected to said second pump outlet, and
- an injector outlet from said bolus chamber.

Claim 28 (previously amended): A medication delivery system comprising:

- §,
- a) a first infusion pump including,
 - a first fluid storage chamber,
 - a first displacement piston displacably positionable to expand or contract said first fluid storage chamber,
 - a first elastic member transitionable between a more stressed position and a less stressed position to displace said first displacement piston, and
 - a first pump outlet for discharging fluid from said first infusion pump in response to displacement of said first displacement piston;
 - b) a second infusion pump including,
 - a second fluid storage chamber,
 - a second displacement piston displacably positionable to expand or contract said fluid storage chamber,
 - a second elastic member transitionable between a more stressed position and a less stressed position to displace said second displacement piston,
 - a second pump outlet for discharging fluid from said second infusion pump in response to displacement of said second displacement piston,
 - a pump flowpath providing fluid communication between said first fluid storage chamber and said first pump outlet, wherein said pump flowpath has

a flow restriction and a drip chamber with a drip chamber wall, an upper portion, and a lower portion, and wherein said flow restriction is sized to convert a continuous stream of a fluid entering said flow restriction from said first fluid storage chamber to a drip stream exiting said flow restriction into said drip chamber, and

an outlet tube positioned beneath said flow restriction in said lower portion of said drip chamber and extending toward said upper portion, said outlet tube having a smaller cross section than said drip chamber to define a fluid accumulation space between said outlet tube and said drip chamber wall where at least some of said fluid exiting said flow restriction into said drip chamber accumulates; and

c) a bolus injector positioned in series with said second infusion pump including,

a flexible bladder,
a bolus chamber enclosed by said flexible bladder,
an injector inlet into said bolus chamber and connected to said second pump outlet, and
an injector outlet from said bolus chamber.

Claim 29 (previously amended): A medication delivery system comprising:

a) an infusion pump including,
a fluid storage chamber for storing fluid medication,
a displacement piston displacably positionable to expand or contract said fluid storage chamber,
an elastic member transitionable between a more stressed position and a less stressed position to displace said displacement piston,
a pump outlet for discharging a fluid from said infusion pump in response to displacement of said displacement piston, and

8
a pump flowpath providing fluid communication between said fluid storage chamber and said pump outlet, said pump flowpath including a flow restriction, a drip chamber, a sight window, and an outlet tube, wherein said drip chamber has a drip chamber wall, an upper portion, and a lower portion, said flow restriction exiting into said drip chamber and said outlet tube positioned beneath said flow restriction in said drip chamber separated from said flow restriction by a drip gap, said sight window oriented to enable visual contact with said drip chamber, wherein said flow restriction is sized to convert a continuous stream of fluid entering said flow restriction from said fluid storage chamber to a drip stream exiting said flow restriction into said drip chamber and wherein said outlet tube extends toward said upper portion, said outlet tube having a smaller cross section than said drip chamber to define a fluid accumulation space between said outlet tube and said drip chamber wall where at least some of said fluid exiting said flow restriction into said drip chamber accumulates; and

b) a bolus injector positioned downstream of said fluid storage chamber in fluid communication with said fluid storage chamber, said bolus injector including,
a flexible bladder,
a bolus chamber enclosed by said flexible bladder,
an injector inlet into said bolus chamber, and
an injector outlet from said bolus chamber.

Claim 30 (previously presented): The system of claim 29 wherein said drip chamber has a volumetric center and said outlet tube has an inlet end and further wherein said inlet end of said outlet tube is positioned approximately at said volumetric center of said drip chamber.

Claim 31 (previously presented): The system of claim 26, wherein said outlet tube

is configured to revert said drip stream exiting said flow restriction to a reverted continuous stream.

Claim 32 (previously presented): The system of claim 27, wherein said outlet tube is configured to revert said drip stream exiting said flow restriction to a reverted continuous stream.

Claim 33 (previously presented): The system of claim 28, wherein said outlet tube is configured to revert said drip stream exiting said flow restriction to a reverted continuous stream.

Claim 34 (previously presented): The system of claim 29, wherein said outlet tube is configured to revert said drip stream exiting said flow restriction to a reverted continuous stream.

Claim 35 (new): A medication delivery system comprising:

- a) an infusion pump including,
 - a fluid storage chamber for storing fluid medication,
 - a displacement piston displaceably positionable to expand or contract said fluid storage chamber,
 - an elastic member transitionable between a more stressed position and a less stressed position to displace said displacement piston, and
 - a pump outlet for discharging a fluid from said infusion pump in response to displacement of said displacement piston; and
- b) a bolus injector positioned downstream of said fluid storage chamber in fluid communication with said fluid storage chamber, said bolus injector including,
 - a flexible bladder,
 - a bolus chamber enclosed by said flexible bladder,

an injector inlet into said bolus chamber, and
an injector outlet from said bolus chamber.

Claim 36 (new): A medication delivery system comprising:

- a) an infusion pump including,
a fluid storage chamber for storing fluid medication,
a displacement piston displacably positionable to expand or contract
said fluid storage chamber,
an elastic member transitionable between a more stressed position
and a less stressed position to displace said displacement piston, and
a pump outlet for discharging fluid from said infusion pump in
response to displacement of said displacement piston; and
b) a bolus injector positioned in series with said infusion pump including,
a flexible bladder,
a bolus chamber enclosed by said flexible bladder,
an injector inlet into said bolus chamber and connected to said pump
outlet, and
an injector outlet from said bolus chamber.

Claim 37 (new): A medication delivery system comprising:

- a) an infusion pump including,
a fluid storage chamber,
a displacement piston displacably positionable to expand or contract
said fluid storage chamber,
an elastic member transitionable between a more stressed position
and a less stressed position to displace said displacement piston,
a first pump outlet for discharging fluid from said infusion pump in
response to displacement of said displacement piston, and

a second pump outlet for discharging fluid from said infusion pump in response to displacement of said displacement piston; and

b) a bolus injector in fluid communication with said fluid storage chamber including,

a flexible bladder,

a bolus chamber enclosed by said flexible bladder,

an injector inlet into said bolus chamber and connected to said second pump outlet, and

an injector outlet from said bolus chamber.

8, Claim 38 (new): A medication delivery system comprising:

a) a first infusion pump including,

a first fluid storage chamber,

a first displacement piston displaceably positionable to expand or contract said first fluid storage chamber, and

a first elastic member transitionable between a more stressed position and a less stressed position to displace said first displacement piston, and

a first pump outlet for discharging fluid from said first infusion pump in response to displacement of said first displacement piston;

b) a second infusion pump including,

a second fluid storage chamber,

a second displacement piston displaceably positionable to expand or contract said fluid storage chamber,

a second elastic member transitionable between a more stressed position and a less stressed position to displace said second displacement piston, and

a second pump outlet for discharging fluid from said second infusion pump in response to displacement of said second displacement piston; and

§ c) a bolus injector positioned in series with said second infusion pump including,

a flexible bladder,

a bolus chamber enclosed by said flexible bladder,

an injector inlet into said bolus chamber and connected to said second pump outlet, and

an injector outlet from said bolus chamber.
